INSTRUCTION MANUAL

FOR

STEP ATTENUATOR

Model No. 60
Serial No. 151

RETURN TO
BOMARC
TEST EQUIPMENT STORE
COPY NO. 1

Weinschel Engineering
KENSINGTON, MARYLAND

OFFICIAL RECORDS STATION
FACILITIES

MP MASTER
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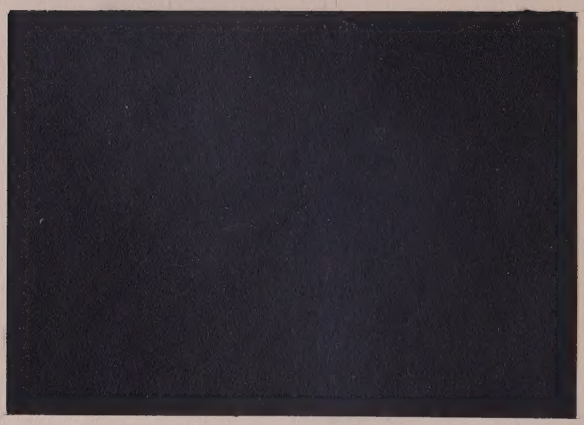

Weinschel Engineering Co., Inc.

10503 METROPOLITAN AVENUE, KENSINGTON, MD. Lockwood 4-0122

Step Attenuators
Coaxial Attenuator Pads
Coaxial Power & Pulse Power Pads

Insertion Loss Test Sets
Bolometer Preamplifiers
Coaxial Terminations

INSTRUCTION MANUAL

FOR

STEP ATTENUATOR

Model No. 60
Serial No. 151
Job No. 8-1778

IM#6
13 Pages

Date: November 1955

Bolometer Mounts
Keyboard Oscillator
Attenuation Standards

Power Measuring Bridges
Micro Potentiometers
Thermistor Mounts

For Standards of Attenuation Use Weinschel Engineering Co.'s Coaxial Pads

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R.F. Tests -	
Dwg. B-114-30, Insertion Loss Test Set No. 1, Group 1	following 11
Dwg. B-114-121, Insertion Loss Test Set No. 3, Group 1	following 11

ELECTRICAL PERFORMANCE SPECIFICATIONS

Frequency Range: DC-1000 MC

Impedance: 50 ohms, Female "N" Connectors

Maximum VSWR: DC 400 MC 1.10
DC 1000 MC 1.15

Maximum Power Input: 100 MW CW When properly terminated

	Equipment Specification				Calibration			
D. C. Voltage Division	Range DB							Range DB
	Accuracy DB							Accuracy DB
D. C. Insertion Loss	Range DB	1-5	6-10	20-50	1-50			Range DB
	Accuracy DB	.02	.05	.1	.01			Accuracy DB
Change of Incremental Insertion Loss DC - 1000 MC	Range DB	1-10	20-50		1-30	40-50		Range DB
	Max. Change DB	.1	.1/10 DB		.1	.2		Accuracy DB
Max. Zero Insertion Loss in DB	DC	400 MC	1000 MC		DC	400 MC	1000 MC	Accuracy DB
	.005	.2	.4		.002	.05	.05	

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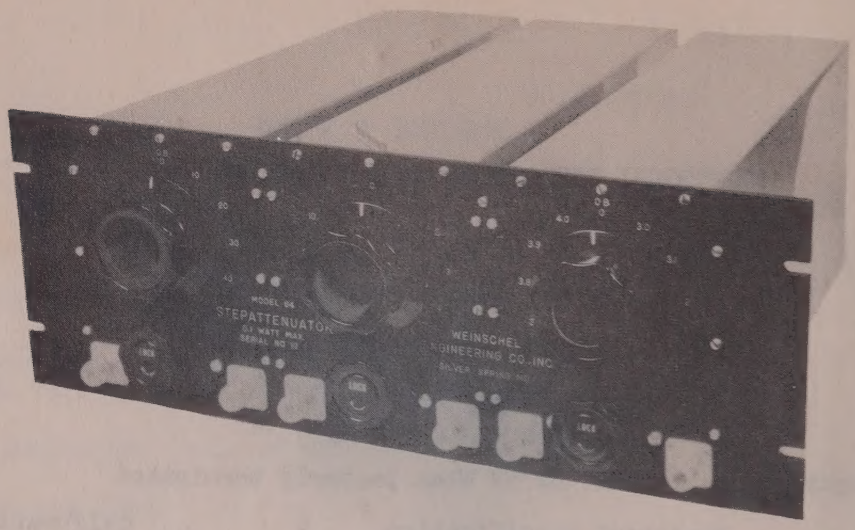
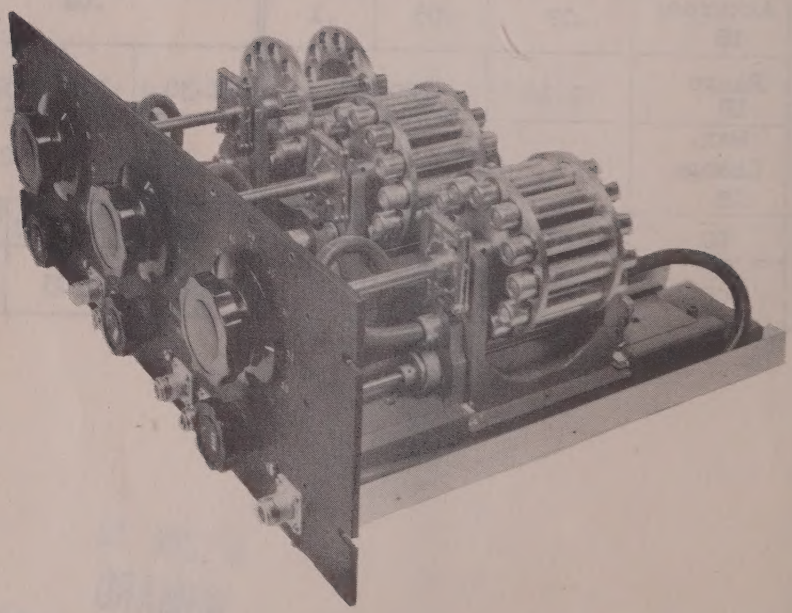


P-29
Front View of Model 64



P-48
Side View of Model 64
(With Shields Removed)

INSERTION LOSS CALIBRATION DATA Date 7/29/58

Model No. 60 Serial No. 151 Job No. 8-1778

Nominal DB	DC Voltage Division DB	DC Insertion Loss DB	400 MC Insertion Loss		1,000MC Insertion Loss		MC Insertion Loss		MC Insertion Loss	
			Zero Loss DB	Above Zero Loss DB	Zero Loss DB	Above Zero Loss DB	Zero Loss DB	Above Zero Loss DB	Zero Loss DB	Above Zero Loss DB
0	0	0	.15		.25					
1	1.08	.98		1.0		1.1				
2	2.00	1.98		2.0		2.1				
3	3.01	3.01		3.0		3.1				
4	4.04	3.99		4.0		4.1				
5	5.05	4.99		5.0		5.1				
6	5.98	5.97		6.0		6.1				
7	7.08	6.98		7.0		7.1				
8	8.00	7.96		8.0		8.1				
9	9.03	9.00		9.0		9.1				
10	9.99	9.99		10.0		10.1				
0	0	0	.15		.25					
10	10.03	9.99		10.0		10.0				
20	19.99	19.96		20.0		20.2				
30	30.00	29.91		30.0		29.9				
40	40.09	40.05		40.0		39.6				
50	5107	50.09		50.3		50.0				
Model 64 only: 0										
3.0										
3.1										
3.2										
3.3										
3.4										
3.5										
3.6										
3.7										
3.8										
3.9										
4.0										

VSWR TEST DATA

Date 7/29/58

Model No. 60 Serial No. 151 Job No. 8-1778

Nominal DB	400 MC Left Input	400 MC Right Input	1,000 MC Left Input	1,000 MC Right Input	MC Left Input	MC Right Input	MC Left Input	MC Right Input
0	1.05	1.06	1.13	1.14				
1	1.02	1.05	1.06	1.08				
2	1.04	1.06	1.13	1.14				
3	1.05	1.06	1.12	1.15				
4	1.03	1.04	1.06	1.10				
5	1.02	1.04	1.03	1.08				
6	1.02	1.03	1.03	1.06				
7	1.02	1.04	1.04	1.02				
8	1.02	1.02	1.02	1.05				
9	1.03	1.02	1.08	1.04				
10	1.04	1.06	1.12	1.13				
0	1.08	1.07	1.03	1.06				
10	1.02	1.02	1.12	1.15				
20	1.09	1.10	1.11	1.15				
30	1.08	1.08	1.10	1.15				
40	1.04	1.03	1.08	1.07				
50	1.06	1.07	1.14	1.10				
Model 64 only								
0								
3.0								
3.1								
3.2								
3.3								
3.4								
3.5								
3.6								
3.7								
3.8								
3.9								
4.0								

O.K.

IM#6

OPERATING INSTRUCTIONS

Do not apply power unless the output of the attenuator is properly terminated.

Do not apply more than 2.2 volts RMS to the input of the stepattenuator while its output is properly terminated.

This equipment is designed for a maximum of 100 milliwatts input when properly terminated. Do not use pulse power exceeding 100 milliwatts peak. External pads should be used to reduce the input to 100 milliwatts.

Pads up to 10 watts can be supplied as regular catalog items if you advise us as to attenuation required and frequency range to be covered. Your inquiries for pads above 10 watts are invited.

Two or more drums can be connected in series by using a short cable consisting of about 12" of RG-9U cable and two UG-21/BU connectors (not regularly furnished).

A clockwise rotation of the lower knob marked "lock" will engage the pair of coaxial switches. Always rotate the lower knob counterclockwise to its stop before turning the main dial.

Always bring the main dial to its final position before engaging the coaxial switches. Otherwise, it is possible to damage the switches.

MAINTENANCE

Check of Attenuation.

This attenuator can be checked at D.C.; unless the switches have worn badly; the high frequency response will be unaltered as long as the DC response has remained constant. If there is reason to believe that a pad has changed its value of attenuation due to, e.g., serious overload, its attenuation can be checked easily, using either a D.C. potentiometer to obtain the ratio of input to output voltage while the attenuator is terminated in a 50 ohm resistor (See Figure 1), or it can be compared with the attenuation of a precision wirewound attenuator box by placing both in parallel (See Figure 2). R.F. insertion loss may be checked per attached Drawing B-114-30 and B-114-121.

Replacement pads may be ordered from us; obtain the part number from the List of Major Parts and return the defective pad with the order.

Wear of Switches:

Do not lubricate the contacts.

The life of each switch usually exceeds 10,000 operations. If the male pin of the cable assembly has worn too much, we recommend replacement of the respective cable assembly, our part number 101-10, since the cable assemblies are tested at 1,000 mc and their VSWR must be below 1.05 but usually does not exceed 1.03.

We recommend for VSWR measurements the use of the Rollin Model 62 Slotted Line in combination with a Hewlett-Packard VSWR Meter Type 415. As a signal source, we recommend H.P. Signal Generator Type 608(10-500 mc) and its companion instrument, Type 612(450-1200 mc) including low pass R.F. filter for harmonic suppression.

Lubrication:

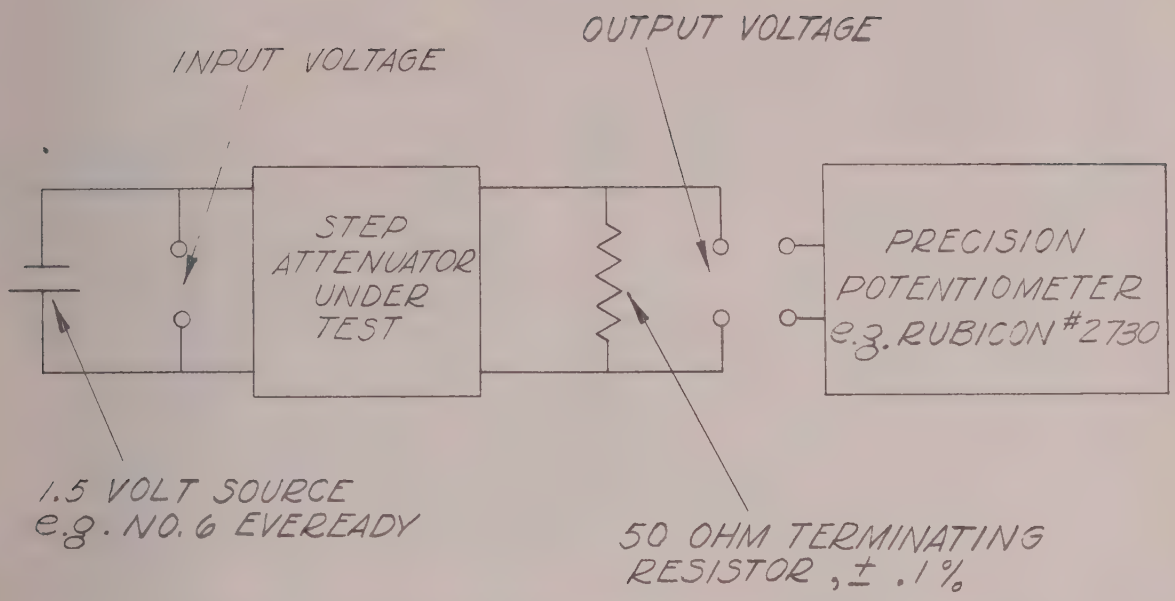
After above 2,000 operations, the sliding surfaces of the switch base, the wearing surfaces of the worm gears and of the detent and detent rollers should be lubricated. We recommend "No. 8 Lubriplate" as supplied by Fiske Brothers Refining Co., Newark, N.J.

Shipping Instructions:

Should it be desirable to return the instrument for repair or calibration, please pack the equipment floating, using a minimum of 3" of excelsior between inner and outer packing case to protect it against shock and vibration. Engage all switches in the zero position before shipment.

LIST OF MAJOR PARTS

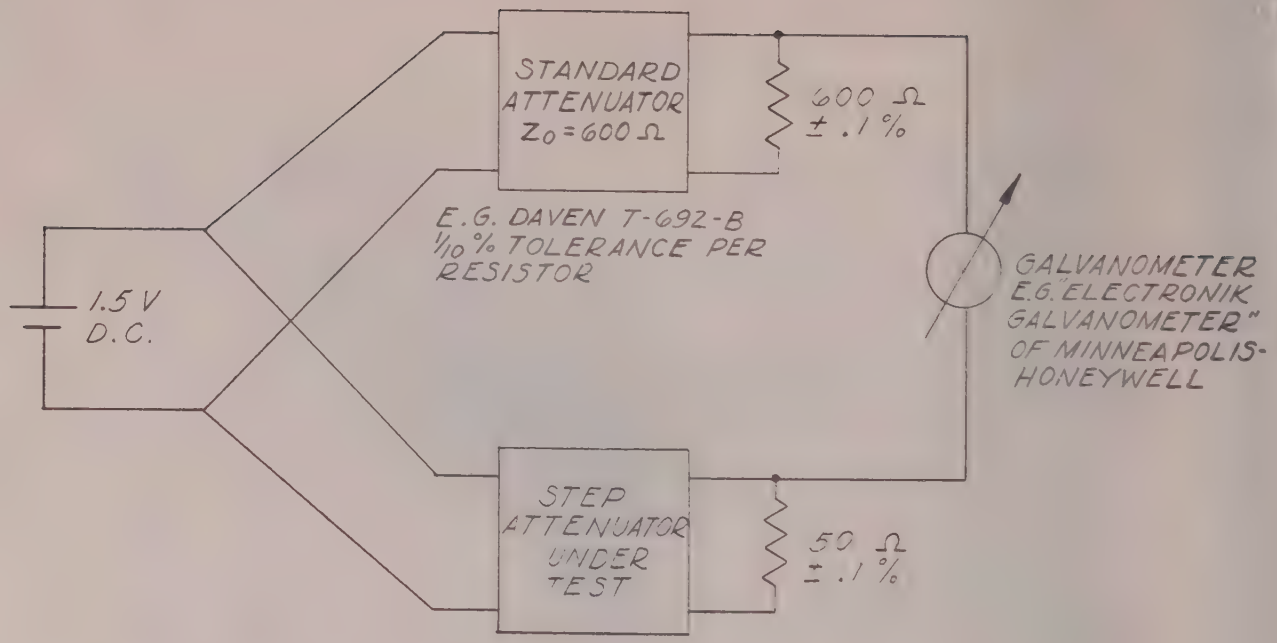
Model 60 Quantity	Model 64 Quantity	Description	Our Part Number
1	-	Panel for 2 drum stepattenuator	105-3
-	1	Panel for 3 drum stepattenuator	107-2
2	3	Switch subassembly without attenuator pads	101-20
2	3	Large knob	101-11
2	3	Small knob	101-12
4	6	Cable assembly	101-10
2	3	0 db pad assembly	101-1-0 db
1	1	1 db pad assembly	101-1-1 db
1	1	2 db pad assembly	101-1-2 db
1	2	3 db pad assembly	101-1-3 db
1	2	4 db pad assembly	101-1-4 db
1	1	5 db pad assembly	101-1-5 db
1	1	6 db pad assembly	101-1-6 db
1	1	7 db pad assembly	101-1-7 db
1	1	8 db pad assembly	101-1-8 db
1	1	9 db pad assembly	101-1-9 db
2	2	10 db pad assembly	101-1-10 db
1	1	20 db pad assembly	101-1-20 db
1	1	30 db pad assembly	101-1-30 db
1	1	40 db pad assembly	101-1-40 db
1	1	50 db pad assembly	101-1-50 db
1	1	3.1 db pad assembly	101-1-3.1 db
-	1	3.2 db pad assembly	101-1-3.2 db
-	1	3.3 db pad assembly	101-1-3.3 db
-	1	3.4 db pad assembly	101-1-3.4 db
-	1	3.5 db pad assembly	101-1-3.5 db
-	1	3.6 db pad assembly	101-1-3.6 db
-	1	3.7 db pad assembly	101-1-3.7 db
-	1	3.8 db pad assembly	101-1-3.8 db
-	1	3.9 db pad assembly	101-1-3.9 db


INPUT VOLTAGE
OUTPUT VOLTAGE
STEP ATTENUATOR UNDER TEST
PRECISION POTENTIOMETER e.g. RUBICON #2730
1.5 VOLT SOURCE e.g. NO. 6 EVEREADY
50 OHM TERMINATING RESISTOR, ± .1%

$$\text{VOLTAGE DIVISION IN db} = 20 \log_{10} \frac{\text{INPUT VOLTS}}{\text{OUTPUT VOLTS}}$$

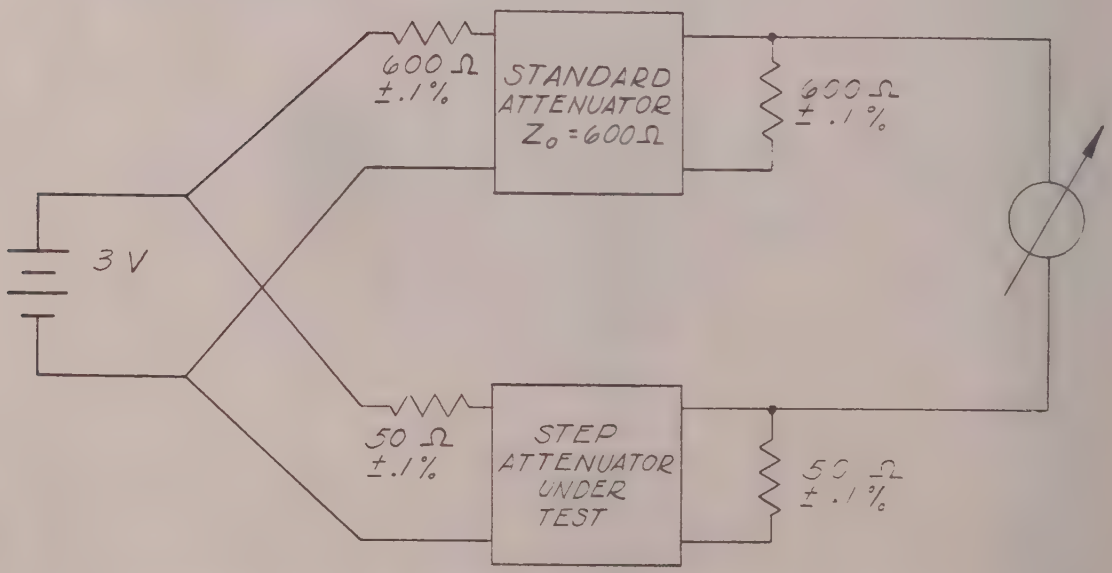
CHECK OF VOLTAGE DIVISION BY MEANS OF D.C. POTENTIOMETER

Figure 1



COMPARISON OF D.C. VOLTAGE DIVISION WITH STANDARD ATTENUATOR

Figure 2



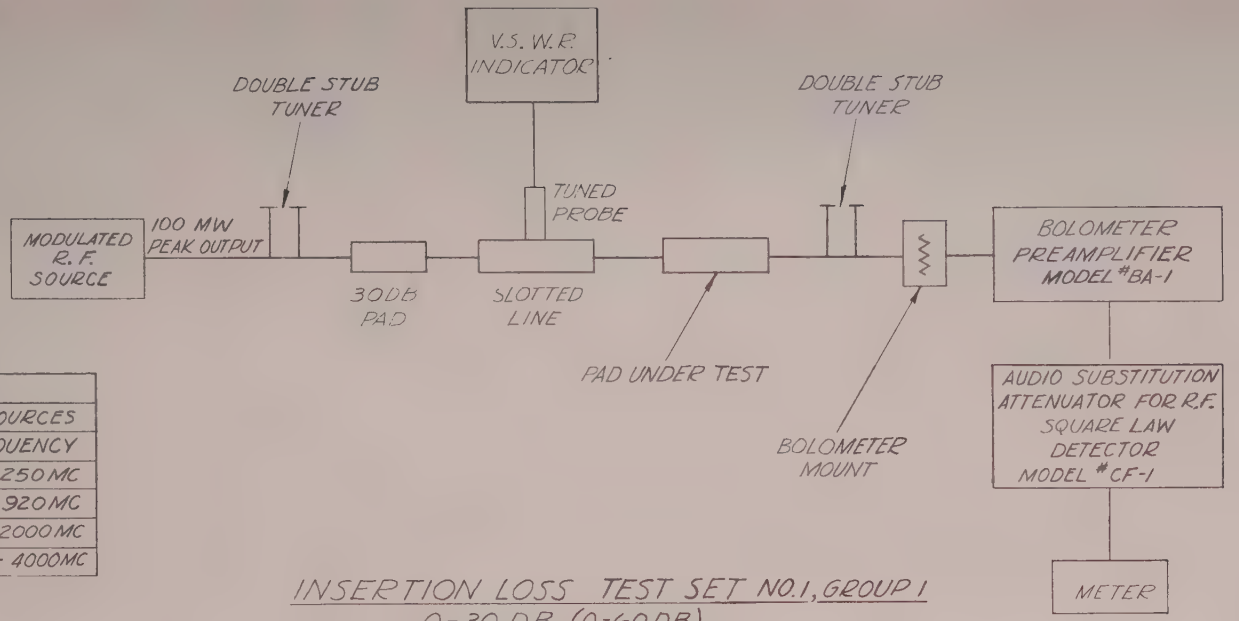
COMPARISON OF D.C. INSERTION LOSS WITH STANDARD ATTENUATOR

Figure 3

B114-30 A

TOLERANCES

ALL 3 PLACE DECIMAL DIMS. ± .003
ALL 2 PLACE DECIMAL DIMS. ± .01
ALL FRACTIONAL DIMS. ± 1/64
ALL ANGLES ± ½°
UNLESS OTHERWISE SPECIFIED



LIST OF MODULATED R.F. SOURCES	
MODEL NO.	FREQUENCY
MS-1	50-250 MC
MS-2	250-920 MC
MS-3	900-2000 MC
MS-4	2000-4000 MC

INSERTION LOSS TEST SET NO.1, GROUP 1
0-30 DB (0-60 DB)

NOTES:
1- 30 DB CAN BE MEASURED IN ONE STEP BY USING THE BA-1 AND CF-1.
2- IF THE GENERATOR OUTPUT IMPEDANCE IS ADJUSTED TO PRESENT THE PROPER SOURCE IMPEDANCE, THIS RANGE MAY BE EXTENDED TO 60 DB BY THE USE OF A CALIBRATED 30 DB PAD APPLYING THE R.F. SUBSTITUTION METHOD.

REVISIONS

A	REVISED 5-23-55	

USED ON	ASSY. DRWG.

Weinschel Engineering Co.
SILVER SPRING, MD.

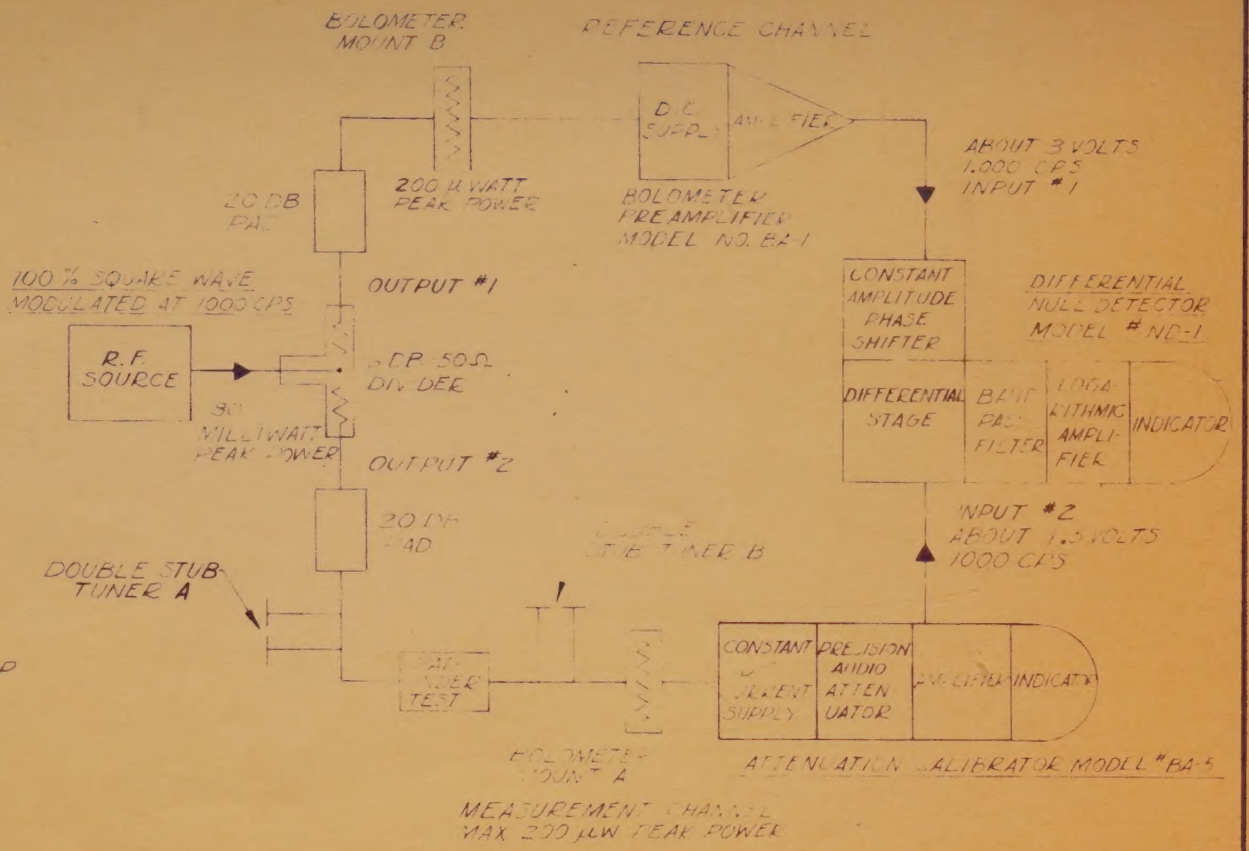
INSERTION LOSS TEST SET NO.1, GROUP 1 0-30DB (0-60DB)

MATERIAL
FINISH
D. C. SCALE
T 124
B 114-30 A

8114-121 A

TOLERANCES
ALL 3 PLACE DECIMAL DIMS. ± .003
ALL 2 PLACE DECIMAL DIMS. ± .01
ALL FRACTIONAL DIMS. ± 1/64
ALL ANGLES ± ½°
UNLESS OTHERWISE SPECIFIED

LIST OF MODULATED R.F. SOURCES	
MODEL NO.	FREQUENCY
MS-1	50-250 MC
MS-2	250-920 MC
MS-3	900-2000 MC
MS-4	2000-4000 MC



NOTE:
1- 0-20 DB CAN BE MEASURED IN ONE STEP BY USING BA-1, BA-5, AND ND-1.

REVISIONS		
A	REVISED	7-11-55

USED ON	ASSY. DRWG.

Weinschel Engineering Co.
SILVER SPRING, MD.

INSERTION LOSS TEST SET NO. 3 0-20DB GROUP 1

MATERIAL
FINISH
D C SCALE
T A
B 8114-121 A

MP MASTER
MA35916